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Date: 8-23-02

Himanshu S. Amin

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of:

Applicants: Anwar Chitayat, *et al.*

Serial No: 09/817,622

Filing Date: March 26, 2001

Examiner: Burton Mullins

Art Unit: 2834

Title: SYSTEM AND METHOD TO CONTROL ROTARY-LINEAR ACTUATOR

Box Non-Fee Amendment
Assistant Commissioner for Patents
U.S. Patent and Trademark Office
Washington, D.C. 20231

REPLY TO OFFICE ACTION DATED MAY 23, 2002

Dear Sir:

Favorable reconsideration of the above-identified patent application is respectfully requested in view of the following remarks and amendments.

CLEAN VERSION OF REPLACEMENT PARAGRAPH TO THE SPECIFICATION AND ALL PENDING CLAIMS

In the Specification:

Please replace the 1st full paragraph on page 1 (lines 5-8) with the following paragraph:

a'

The present application is a continuation-in-part of U.S. Application Ser. No. 09/415,562, filed October 8, 1999, and entitled ROTARY-LINEAR ACTUATOR, which is a continuation of U.S. Application Ser. No. 08/668,705, which was filed June 24, 1996, and entitled ROTARY-LINEAR ACTUATOR, now U.S. Patent No. 6,137,195, which is based on U.S. Provisional Patent Application Serial No. 60/015,705, which was filed March 28, 1996, and a continuation-in-part of U.S. Application Ser. No. 08/481,239, which was filed June 6, 1995, which is now abandoned.

In the Claims:

All pending claims are listed in this section for purposes of clarity, with claims that have been amended identified as such. Claim 11 has been amended herein – the marked up version of this claim is found at page 15 of this Reply.

a2 cont.

1. An integrated rotary-linear actuator system, comprising:

a plunger movable along and rotatable about a longitudinal axis extending through the plunger;

a coil system having coils arranged to, when energized, interact with the plunger to move the plunger in at least one of a rotational mode and in a linear mode;

an amplifier coupled to the coils and operative to provide electrical energy to energize the coils; and

a control system coupled with the amplifier, the control system having a network interface operative to receive control information, the control system being operative to control the amplifier to selectively energize the coils to effect desired movement of the plunger based on the control information received via the network interface.

a2 cont.

2. The system of claim 1, further comprising an array of magnets arranged on one of an outside surface of the plunger and an inside surface of a motor support, which supports the plunger to permit movement thereof.

3. The system of claim 2, wherein the coil system further comprises a first set of coils arranged to apply an axial force on the array of magnets to drive the plunger in a linear mode and a second set of coils arranged to apply a tangential force on the array of magnets to drive the plunger in rotational mode.

4. The system of claim 2, wherein the motor support comprises a bearing support and a housing that define a well operative to receive the plunger, the plunger being supported by a bearing located between the plunger and the bearing support, such that the plunger is axially movable along the longitudinal axis between a retracted position and an extended position and rotatable about the longitudinal axis.

5. The system of claim 2, wherein the coil system further comprises first and second sets of coils, the first set of coils being operative to provide an electric field to effect movement of the plunger in a linear mode, the second set of coils being operative to effect movement of the plunger in a rotational mode.

6. The system of claim 5, wherein the amplifier further comprises first and second amplifiers, each being operative to provide electrical energy to a respective one of the first and second coils.

7. The system of claim 1 in combination with a network to which the network interface is coupled, the combination further comprising a computer operative to communicate the control information to the control system via the network interface using a network protocol.

a2 cont.

8. The combination of claim 7, wherein the control information includes program data to program operating characteristics of at least part of the integrated rotary-linear actuator system.

9. The combination of claim 7, wherein the integrated rotary-linear actuator system further comprises at least one sensor operative to sense a condition of the integrated rotary-linear actuator system and provide a sensor signal indicative thereof, the control system being operative to communicate condition data based on the sensor signal to the computer via the network interface using the network protocol.

10. The combination of claim 9, wherein the control information includes program data operative to program operating characteristics of at least part of the integrated rotary-linear actuator system based on evaluation of the condition data from the integrated rotary-linear actuator system.

11. (Amended) A rotary-linear actuator system, comprising:

a motor support having a well;

a plunger supported for movement in at least part of the well so as to enable axial movement of the plunger relative to the well along a longitudinal axis of the plunger and rotational movement of the plunger about the longitudinal axis;

an array of magnets associated with the plunger;

a first set of coils arranged to, when energized, apply an electric field that interacts with the array of magnets and provides an axial force to drive the plunger element in a linear mode;

a second set of coils arranged to, when energized, apply an electric field that interacts with the array of magnets and provides a tangential force to drive the plunger element in a rotational mode; and

a2 cont.

an integrated control system having a network interface operative to receive control information via an associated network, the control system being operative to selectively energize the first and second sets of coils to effect movement of the plunger in at least one of the linear and rotational modes.

12. The system of claim 1, further comprising a computer operative to communicate the control information to the control system via the associated network using a network protocol.

13. The system of claim 12, wherein the control information includes program data having executable instructions to program the control system to effect desired operating characteristics of the rotary-linear actuator system.

14. The system of claim 12, wherein the rotary-linear actuator system further comprises at least one sensor operative to sense a condition of the rotary-linear actuator system and provide a sensor signal indicative thereof, the control system being operative to communicate condition data based on the sensor signal to the computer via the associated network using the network protocol.

15. The system of claim 14, wherein the control information includes program data to program operating characteristics of at least part of the integrated rotary-linear actuator system based on evaluation of the condition data from the integrated rotary-linear actuator system.

16. An integrated rotary-linear actuator system, comprising:

means for supporting a plurality of motors including means for supporting a bearing, the means for supporting the plurality of motors and the means for supporting the bearing defining a well;

means for moving a stage and adapted to be received by the well, the means for moving the stage being axially movable along its longitudinal axis between retracted and extended conditions and rotatable about its longitudinal axis, the means for moving the stage

being supported by a bearing located between the means for moving the stage and the means for supporting the bearing;

a2 cont.

means for providing a magnetic field arranged on the means for moving the stage;

means for applying a substantially axial force on the means for providing the magnetic field and driving the means for moving the stage linearly;

means for applying a substantially tangential force on the means for providing the magnetic field for the means for moving the stage rotationally;

means for amplifying an electrical signal and providing the amplified signal to at least one of the means for applying; and

control means for controlling the means for amplifying, the control means including means for interfacing with an associated network and receiving control information to program the control means to control the means for amplifying to selectively activate the means for applying.

17. A method for controlling an integrated rotary-linear actuator system, the rotary-linear actuator system including a network interface to enable communication over an associated network, the method comprising:

receiving control information at the network interface of the integrated rotary-linear actuator system via the associated network;

programming operating parameters of the rotary-linear actuator system based on the received control information; and

controlling an amplifier to selectively energize coils of the rotary-linear actuator system according to the programmed operating parameters, such that a plunger, which is moveable linearly and rotationally about a longitudinal axis thereof, moves in at least one of a linear and rotational direction in response to the selective energization of the coils.

18. The method of claim 17, wherein the control information is communicated from a remote computer via the network interface using a network protocol.

a2 cncl'd.

19. The method of claim 20, wherein the control information includes program data, the operating parameters of the rotary-linear actuator system being programmed based on the program data.

20. The method of claim 18, further comprising:

sensing at least one condition of the integrated rotary-linear actuator system;

providing a sensor signal indicative of the sensed at least one condition; and

sending condition data from the integrated rotary-linear actuator system to the computer via the network interface using the network protocol, the condition data being based on the sensor signal.

21. The method of claim 20, wherein the control information includes program data to program the operating parameters of at least part of the integrated rotary-linear actuator system based on evaluation of the condition data sent from the integrated rotary-linear actuator system.

REMARKS

Claims 1-21 are currently pending and under consideration. The specification has been amended herein in accordance with the Examiner's suggestions. Claim 11 has also been amended herein. A clean version of the replacement paragraph to the specification and all pending claims is found at pages 2-7 of this Reply. A version with markings to show the amendments made is found at page 15 of this Reply. Favorable reconsideration of the subject application is respectfully requested in view of the following comments and amendments.

I. Objection of Claim 11

Claim 11 was objected to for containing informalities. Thus, claim 11 has been amended herein in accordance with the Examiner's suggestions. Withdrawal of this objection is respectfully requested.

II. Rejection of Claims 1-2, 4, 7-10 and 17-21 Under 35 U.S.C. 103(a)

Claims 1-2, 4, 7-10 and 17-21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Kemmer *et al.* (U.S. 4,234,831) in view of Spinner *et al.* (U.S. 5,771,174). It is respectfully submitted that this rejection should be withdrawn for at least the following reasons.

Neither Kemmer *et al.* nor Spinner *et al.*, alone or in combination, teach or suggest a control system having a network interface operative to receive control information, the control system being operative to control an amplifier to selectively energize coils to effect desired movement of a plunger based on the control information received via the network interface, as recited in claim 1. The Examiner concedes that Kemmer *et al.* does not teach a network interface operative to receive control information and thus relies on Spinner *et al.* to make up for the deficiencies of Kemmer *et al.* In the Office Action dated May 23, 2002, the Examiner stated, "Spinner's control system selectively energizes the coils to effect desired movement of the plunger based on the control information received via the network interface" (page 3, lines 13-14). However, it is submitted that the control system is Spinner *et al.* does not selectively energize coils to effect movement of a plunger. Rather, in Spinner *et al.*, based on desired setpoints, generated by a host control system, and the actual position of an actuator, a position

error is calculated. The actuator controller then determines a direction that the actuator must move and asserts a slice lip open or close control signal. The actuator motor moves in the open or close direction for as long as the control signal is asserted. (col. 7, lines 2-50).

Further, neither Kemmer *et al.* nor Spinner *et al.* teach or suggest the structural relationship of the control system having a network interface operative to receive control information, as recited in claim 1. The network interface in Spinner *et al.* is included in a gateway, represented by reference numeral 22, while the actuator controller, which receives information from the gateway, is represented by reference numeral 30. As illustrated in Fig. 1 of Spinner *et al.*, the controller 30 does not include the network interface 22. Thus, because neither Kemmer *et al.* nor Spinner *et al.*, teach or suggest every limitation of claim 1, the combination of Kemmer *et al.* and Spinner *et al.* does not make obvious claim 1.

Regarding claim 17, neither Kemmer *et al.* nor Spinner *et al.* teach or suggest receiving control information at a network interface of an integrated rotary-linear actuator system and programming operating parameters of the rotary-linear actuator system based on the received control information. Rather, programming operating parameters of a rotary-linear actuator system based on received control information is absent from both references. Kemmer *et al.* mentions that commercially available electronic equipments permits rotary and axial motions of a motor to be controlled according to a program (col. 4, lines 58-60). However, Kemmer *et al.* does not teach or suggest programming operating parameters of the program based on information received at a network interface. Spinner *et al.* teaches moving a position of an actuator based on generated setpoints, however, programming operating parameters based on the received information is not taught or suggested by Spinner *et al.* The parameters listed in col. 6, lines 44+ of Spinner *et al.*, as relied on by the Examiner, are not based on information received at the network interface (*e.g.*, generated setpoints). Accordingly, because neither reference teaches or suggest programming operating parameters based on information received at a network interface, the combination of Kemmer *et al.* and Spinner does not make claim 17 obvious.

Moreover, the Examiner contends that it would have been obvious to modify Kemmer *et al.* and provide a network interface per Spinner *et al.* Applicants respectfully disagree. Rather, it is submitted that Kemmer *et al.* and Spinner *et al.* cannot be combined to make the present

invention obvious because there is not proper suggestion or motivation to combine the references teachings to create the subject matter of claims 1 and 17.

Applicable Law:

> The references themselves must suggest the desirability and thus the obviousness of making the combination without the slightest recourse to the teachings of the patent or application. Without such independent suggestion, the cited art is to be considered merely to be inviting unguided and speculative experimentation which is not the standard with which obviousness is determined. *Amgen, Inc. v. Chugai Pharmaceutical Co. Ltd.*, 927 F.2d 1200, 18 USPQ2d 1016 (Fed. Cir. 1991); *In re Laskowski*, 871 F.2d 115, 117, 10 USPQ2d 1397, 1398 (Fed. Cir. 1989); *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1532 (Fed. Cir. 1988); *Hodosh v. Block Drug*, 786 F2f at 1143 n. 5., 229 USPQ at 187 n. 4.; *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1985).

Furthermore, according to the Federal Circuit,

> ...'virtually all [inventions] are combinations of old elements.' Therefore an examiner may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. Such an approach would be 'an illogical and inappropriate process by which to determine patentability.' *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2d 1453 (Fed. Cir. 1998) (*citations omitted*).

Kemmer is directed to a compound rotary and/or linear motor; while Spinner *et al.* is directed to systems for controlling the cross-directional profile of sheet materials, such as paper, during manufacture thereof. Obviousness cannot be established by combining the teachings of the cited art to produce the claimed invention, absent some teaching or suggestion supporting the combination. And teachings of references can be combined *only* if there is some suggestion or incentive to do so. Here, neither the nature of the problem to be solved, the teachings in the cited art, nor the knowledge of persons of ordinary skill provides sufficient suggestion or motivation to

combine the references. Instead, the Examiner relied on improper hindsight in reaching his obviousness determination. The Federal Court has held that to imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher. One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to depreciate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d (BNA) 1596 (Fed. Cir. 1988) (citations omitted). Thus, Kemmer *et al.* and Spinner *et al.* cannot be combined to make the present invention obvious because there is not proper suggestion or motivation to combine the references teachings to create the subject matter of claims 1 and 17.

In addition to lacking the structural and functional interrelationships of a control system having a network interface for receiving control information, the cited references contain no teaching or suggestion of the control system selectively energizing coils to effect movement of a plunger based on information received via the network interface. Kemmer *et al.* further does not mention or allude to any problem that would have suggested to one of ordinary skill in the art to use a network interface in connection with a rotary-linear actuator system, as recited in claims 1 and 17.

Claims 2, 4, and 7-10 depend from independent claim 1; and claims 18-21 depend from independent claim 17. Thus, for the aforementioned reasons, withdrawal of this rejection and allowance of claims 1-2, 4, 7-10 and 17-21 are respectfully requested.

III. Rejection of Claims 11-15 Under 35 U.S.C. 103(a)

Claims 11-15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo *et al.* (U.S. 4,644,205) in view of Spinner *et al.* (U.S. 5,771,174). It is respectfully submitted that this rejection should be withdrawn for at least the following reasons.

Neither Sudo *et al.* nor Spinner *et al.* teaches or suggests an integrated control system having a network interface operative to receive control information via an associated network, the control system being operative to selectively energize first and second sets of coils to effect movement of the plunger in at least one of linear and rotational modes, as recited in claim 11. In the Office Action dated May 23, 2002, the Examiner concedes that Sudo *et al.* does not teach a

network interface operative to receive control information via an associated network; and thus, relies on Spinner *et al.* to make up for the deficiencies of Sudo *et al.* However, in Spinner *et al.* a host control system 26 and actuator controllers 30 are connected by connections 32 with a gateway 22, which the Examiner relies on as being equivalent to the network interface of claim 11. The gateway 22 converts and transmits information to and from the host control system 26 and the actuator controllers 30. However, neither the host control system 26 nor the actuator controllers 30 include the gateway 22. Thus, the structural relationship of the integrated control system *having* a network interface, as recited in claim 11, is absent from Spinner *et al.*

Further, neither the control system 26 nor the actuator controllers 30 in Spinner *et al.* are operative to selectively energize coils to effect movement of a plunger, as discussed in more detail in Section II, above. Accordingly, because neither Sudo *et al.* nor Spinner *et al.* teach or suggest every limitation of claim 11, the combination of Sude *et al.* and Spinner *et al.* do not make obvious claim 11.

Moreover, it is submitted that Sudo *et al.* and Spinner *et al.* cannot be combined to make the present invention obvious because there is not proper suggestion or motivation to combine the references teachings to create the subject matter of claims 1 and 17. Sudo *et al.* is directed to a positioning device of magnetic suspension which comprises a cylindrical stationary member and a cylindrical floated member arranged coaxially with the stationary member; while Spinner *et al.* is directed to systems for controlling the cross-directional profile of sheet materials, such as paper, during manufacture thereof. Thus, it is submitted that the Examiner relied on improper hindsight in reaching his obviousness determination. In addition to lacking the structural and functional interrelationships of a control system having a network interface for receiving control information, the cited references contain no teaching or suggestion of the control system selectively energizing coils to effect movement of a plunger based on information received via the network interface. Sudo *et al.* further does not mention or allude to any problem that would have suggested to one of ordinary skill in the art to use a network interface in connection with a rotary-linear actuator system, as recited in claim 11.

For the aforementioned reasons, withdrawal of this rejection and allowance of claim 11 and claims 12-15, which depend therefrom, are respectfully requested.

IV. Rejection of Claims 1-10 and 16-21 Under 35 U.S.C. 103(a)

Claims 1-10 and 16-21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sudo *et al.* (U.S. 4,644,205) in view of Spinner *et al.* (U.S. 5,771,174) and Gerard (U.S. 4,751,437). It is respectfully submitted that this rejection should be withdrawn for at least the following reasons.

Independent claims 1, 16, and 17 respectively recite "the control system having a network interface operative to receive control information..."; "the control means including means for interfacing with an associated network and receiving control information..."; and "receiving control information at the network interface of the integrated rotary-linear actuator system via the associated network". It is submitted that such claims elements are similar to the "integrated control system having a network interface operative receive control information via an associated network" element recited in claim 11. As discussed with respect to Sections II and III, above, the combination of Sudo *et al.* and Spinner *et al.* does not make such claim elements obvious. Gerard is relied on by the Examiner to provide an amplifier in the drive control. Accordingly, Gerard does not make up for the deficiencies with respect to the combination of Sudo *et al.* and Spinner *et al.*

Moreover, there is no motivation or suggestion to combine the teachings of Sudo *et al.*, Spinner *et al.*, and Gerard. Sudo *et al.* is directed to a positioning device of magnetic suspension which comprises a cylindrical stationary member and a cylindrical floated member arranged coaxially with the stationary member; while Spinner *et al.* is directed to systems for controlling the cross-directional profile of sheet materials, such as paper, during manufacture thereof; while Gerard is directed to a linear motor having a coil support structure wherein secondary resonances are suppressed, thereby permitted wide bandwidth operation. Thus, it is submitted that the Examiner relied on improper hindsight in reaching his obviousness determination. In addition to lacking the structural and functional interrelationships of a control system having a network interface for receiving control information, the cited references contain no teaching or suggestion of the control system selectively energizing coils to effect movement of a plunger based on information received via the network interface. Furthermore, the cited references do not mention or allude to any problem that would have suggested to one of ordinary skill in the art to use a network interface in connection with a rotary-linear actuator system, as recited in claims 1, 16,

and 17.

For the aforementioned reasons, withdrawal of this rejection and allowance of claim 1, claims 2-9, which depend therefrom, claim 16, claim 17, and claims 18-21, which depend therefrom, are respectfully requested.

V. Conclusion

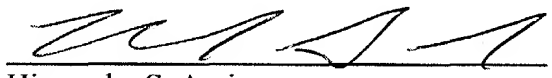
The present application is believed to be in condition for allowance in view of the above comments and amendments. A prompt action to such end is earnestly solicited.

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact applicants' undersigned representative at the telephone number listed below.

In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-1063.

Respectfully submitted,

Amin & Turocy, LLP



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